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Unmet Social Health Needs as a Driver of Inequitable Outcomes After Surgery: A Cross-Sectional Analysis of the National Health Interview Survey

Kathryn K Taylor, MD^{1,2,3,4}, Pooja U Neiman, MD, MPP^{1,2,3,5}, Sidra Bonner, MD, MPH^{1,2,3,6}, Kavitha Ranganathan, MD^{7,8}, Renuka Tipirneni, MD, MSc^{3,9}, John W Scott, MD MPH^{2,3,6}

¹National Clinician Scholars Program, University of Michigan, Ann Arbor, MI

²Center for Healthcare Outcomes and Policy, University of Michigan, Ann Arbor, MI

³Institute for Healthcare Policy and Innovation, University of Michigan, Ann Arbor, MI

⁴Department of Surgery, Stanford University, Stanford, CA

⁵Department of Surgery, Brigham and Women's Hospital, Boston, MA

⁶Department of Surgery, University of Michigan, Ann Arbor, MI

⁷Division of Plastic Surgery, Brigham and Women's Hospital, Boston, MA

⁸Center for Surgery and Public Health, Brigham and Women's Hospital, Boston, MA

⁹Department of Internal Medicine, University of Michigan, Ann Arbor, MI

Abstract

Objective: This study aims to identify opportunities to improve surgical equity by evaluating unmet social health needs by race, ethnicity, and insurance type.

Summary Background Data: Although inequities in surgical care and outcomes based on race, ethnicity, and insurance have been well documented for decades, underlying drivers remain poorly understood.

Methods: We used the 2008–2018 National Health Interview Survey to identify adults age 18 years and older who reported surgery in the past year. Outcomes included poor health status (self-reported), socioeconomic status (income, education, employment), and unmet social health needs (food, housing, transportation). We used logistic regression models to progressively adjust for the impact of patient demographics, SES, and unmet social health needs on health status.

Results: Among a weighted sample of 14,471,501 surgical patients, 30% reported at least one unmet social health need. Compared to non-Hispanic White patients, non-Hispanic Black and Hispanic patients reported higher rates of unmet social health needs. Compared to private insurance, those with Medicaid or no insurance reported higher rates of unmet social health needs. In fully adjusted models, poor health status was independently associated with unmet social health

needs: food insecurity aOR 2.14 (95% CI 1.89–2.41), housing instability aOR 1.69 (95% CI 1.51–1.89), delayed care due to lack of transportation aOR 2.58 (95% CI 2.02–3.31).

Conclusions: Unmet social health needs vary significantly by race, ethnicity, and insurance, and are independently associated with poor health among surgical populations. As providers and policymakers prioritize improving surgical equity, unmet social health needs are potential modifiable targets.

Mini Abstract:

We used the National Health Interview Survey from 2008–2018 to identify possible modifiable drivers of surgical inequities. Among a sample of 14 million, unmet social health needs (i.e. food, housing, transportation needs) varied significantly by race, ethnicity, and insurance and were independent predictors of poor health among surgical patients.

Introduction:

Despite significant advancements in the quality of surgical care overall, inequitable outcomes by race, ethnicity, and insurance type persist.^{1–8} Racial and ethnic minoritized groups have less access to high quality surgical services and worse perioperative outcomes, with excess postoperative mortality as high as 50% greater than White patients.^{1–7,9–13} Similarly, those with Medicaid and those uninsured have been shown to have poorer surgical outcomes, including higher morbidity and mortality.^{2,8,14,15} While hospital-based quality improvement programs such as the American College of Surgeon’s National Surgical Quality Improvement Programs (ACS-NSQIP) have improved morbidity overall¹⁶, stark inequities in outcomes by race, ethnicity, and insurance remain.¹⁷

Our lack of understanding of the mechanisms that drive inequitable outcomes is a potential reason for these persistent inequities. In order to more fully understand both the problem and potential solutions, it is important to distinguish between *social determinants of health* and *unmet social health needs* (Figure 1). Social determinants of health (SDOH) are the conditions in which people live, learn, work, and play and they contribute twice as much to overall health as compared to clinical care. As such, they are also important potential drivers of ongoing inequities. Although many specific SDOHs related to so-called socioeconomic status (SES; i.e. income, education, employment) have long been demonstrated to be associated with poor outcomes, many clinicians feel too far removed from upstream community-level SDOH factors, such as availability of public education and job opportunities, to have an impact.^{18–23} In addition, many aspects of SES may be fixed for an individual patient. In contrast, there is growing evidence that targeted programs addressing *unmet social health needs* (i.e. food insecurity, housing instability, and lack of transportation) of individual patients can lead to improved health outcomes.^{24–34} Addressing unmet social health needs is an attractive policy target, as these needs drive outcomes and are intervenable at the individual rather than the community level. As providers, policymakers, and insurers prioritize more equitable surgical care, it is essential to have a greater understanding of the population differences in social health needs that may underlie surgical inequities.

This study aimed to identify potentially modifiable targets for improving the equity of surgical outcomes. In this cross-sectional analysis of a national sample of adults who underwent surgery in the past year, we examined the association between unmet social health needs and health status, as well as variations by race, ethnicity, and insurance type. We chose to focus on three unmet social health needs that have been shown in the literature to impact outcomes – food insecurity, housing instability, and lack of transportation.^{24–26} These findings are then placed in a policy-relevant context to highlight opportunities to reduce longstanding inequities in health outcomes among surgical patients by addressing unmet social health needs.

Methods:

Data source and Patient Population

We used the data from the combined 2008–2018 National Health Interview Survey (NHIS), a nationally representative household survey of non-institutionalized civilians conducted by the Center for Disease Control. The NHIS is well suited for studying social determinants of health given it includes a broad range of survey questions on socioeconomic and demographic factors, as well as specific questions on unmet social health needs, which are often not available in other national databases. Our study sample included adults aged 18 years or older who reported undergoing surgery in the past year, stratified by race and ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Asian or other) and insurance type (private, Medicare, Medicaid, uninsured). Race and ethnicity in this study were self-reported based on the following groups in the NHIS: Non-Hispanic White, non-Hispanic Black/African American, Hispanic, non-Hispanic Asian, non-Hispanic American Indian/ Alaskan Native, non-Hispanic other single and multiple races. It is important to note that race is a sociopolitical construct and in this analysis was used as a proxy for structural racism as opposed to biological difference.

Key Outcomes

We examined differences by race, ethnicity, and insurance in the following outcome categories: (1) poor health status, (2) SES and (3) unmet social health needs. Poor health status was defined as self-reported health as “fair” or “poor” compared to “excellent,” “very good,” or “good,” in accordance with previous studies using the NHIS.³⁵ Our three SES outcomes included income (<400% Federal Poverty Level (FPL) versus 400% FPL), education (less than high school graduate versus more), and employment status (unemployed versus employed full or part time). Unmet social health needs focused on those with the most data to support interventions^{24–26}, including food insecurity (worry food would run out or food did not last before being able to buy more), housing instability (worry about housing costs), and delayed care due to lack of transportation. Supplemental materials include detailed survey questions used for these definitions. Because all of these outcomes are based upon surveys among patients who report undergoing an operation in the last year, they are reported among post-surgical patients who survived their operation.

Statistical analyses

We used survey weights provided by the NHIS to account for complex survey design. Weighted proportions were used to compare unadjusted differences by race, ethnicity, and insurance. We then used multiple logistic regression models to systematically examine the association of race, ethnicity, insurance, SES, with unmet social health needs on poor health status by adding covariates in a stepwise manner. The dataset was prepared using SAS (v9.4, SAS Institute), all analyses were conducted using Stata (v17; StataCorp), and two-sided $p < 0.05$ was considered significant. This study qualified as “not regulated” by the Institutional Review Board of the University of Michigan due to use of publicly available, de-identified data. This study followed the STROBE guidelines.

Results:

Our weighted sample included 14,471,501 respondents who reported surgery in the past 12 months (Table 1). The majority were female, non-Hispanic White, and had private insurance. Compared to non-Hispanic White patients, non-Hispanic Black and Hispanic patients were more likely to be younger, female, from the South, and be insured by Medicaid or uninsured (Supplement eTable 1). Compared to other insurance types, the uninsured were more likely to be younger (Supplement eTable 2).

Poor Health Status

Among surgical patients, poor health status varied significantly by race, ethnicity, and insurance status (Figure 2). Compared to non-Hispanic White patients, non-Hispanic Black, Hispanic, and Asian patients reported higher rates of poor health. Compared to those with private insurance, surgical patients with Medicare, Medicaid, and no insurance reported higher rates of poor health.

Socioeconomic Status

Socioeconomic status—income, education, and employment status—also varied by race, ethnicity, and insurance (Figure 3). Compared to non-Hispanic White patients, non-Hispanic Black and Hispanic patients were more likely to report income $< 400\%$ FPL and less than high school education. Rates of unemployment were similar across race and ethnicity. Compared to private insurance, the uninsured were more likely to report income $< 400\%$ FPL, less than high school education, and unemployment.

Unmet Social Health Needs

Among all surgical patients, 29.5% reported at least one unmet social need: 16.7% food insecurity, 22.0% housing instability, and 3.3% delayed care due to lack of transportation. Similar to SES, unmet social health needs varied by race, ethnicity, and insurance (Figure 4). Compared to non-Hispanic White patients, non-Hispanic Black and Hispanic patients reported higher rates of food insecurity (32.4% and 28.9%, versus 13.2%, respectively), housing instability (32.8% and 38.2%, versus 18.5%), and delayed care due to lack of transportation (6.0% and 4.7%, versus 2.7%). Compared to private insurance, those with Medicaid and the uninsured reported higher rates of food insecurity (46.1% and 38.9%,

versus 10.0%, respectively), housing instability (43.0% and 50.8%, versus 19.2%), and delayed care due to lack of transportation (11.3% and 5.3%, versus 1.0%).

Adjusted Poor Health Status

In logistic regression models adjusted for patient demographics, non-Hispanic Black and Hispanic patients had 2 times higher likelihood of poor health status compared to non-Hispanic White patients (Table 2). Compared to those with private insurance, Medicare, Medicaid, and the uninsured reported higher rates of poor health status. With the addition of SES factors as covariates in the model, the magnitude of the effect of race, ethnicity, and insurance status on poor health status decreased but remained significant. In models fully adjusted for patient demographics, race, ethnicity, insurance, SES, and unmet social health needs the following variables remained independently associated with poor health status: non-Hispanic Black race, Hispanic ethnicity, Medicare, Medicaid, and all SES and unmet social need factors. After adjusting for SES and unmet social needs, the uninsured were not more likely to report poor health status compared to those with private insurance. Of note, the effect estimates decreased uniformly as additional covariates were added to the model, suggesting that these changes were due to adjusting for factors that contribute to poor health status. There was significant variation of the impact of unmet social health needs on poor health status by geographic region (Supplement eTable 3).

Discussion:

In this study using nationally representative survey data, poor health status, SES, and unmet social needs were found to vary significantly by race, ethnicity, and insurance type among surgical patients in accordance with known inequities. Non-Hispanic Black and Hispanic surgical patients were more likely to report low income and less than high school education, however rates of unemployment were similar compared to White patients. One in three surgical patients reported at least one unmet social need, driven largely by higher rates among non-Hispanic Black and Hispanic patients. While these unmet social needs likely drive inequities in health outcomes, inequities by race, ethnicity and insurance persisted even after adjusting for SES and unmet social health needs. In addition, each SES factor and unmet social health need was found to be an independent predictor of poor health among surgical patients. Thus, intervening on these non-medical factors has great potential for reducing inequities in surgical outcomes.^{24–26}

Inequities in surgical outcomes have been described in many different contexts, however few analyses have focused on the actual mechanisms that drive these inequities or potential interventions to mitigate them. Previous studies have demonstrated differential access to high quality surgical services and poorer outcomes by race and ethnicity.^{1–7,9–13} While differences in hospital quality drive some portion of inequitable outcomes, some component is explained by socioeconomic status and a significant portion remains unexplained.¹⁷ There has recently been increasing attention to the important impact of social vulnerability on surgical outcomes, however there has been little prior discussion of how to address these mechanisms for health improvement.^{36–40} Our findings expand on these studies by describing differences in unmet social health needs by race and ethnicity that may serve

as modifiable drivers of inequities that can be targeted for intervention. We focused on these unmet social health needs (food insecurity, housing instability, lack of transportation) given there is literature supporting interventions to impact outcomes.²⁴⁻²⁶ A multifaceted, interdisciplinary approach at the individual-level is urgently needed to appropriately address the needs of historically marginalized communities and effectively mitigate inequities.

Similarly, while insurance-based inequities have been well documented, there is less understanding of which components of insurance design are more protective against poor outcomes. Numerous prior studies have demonstrated that the uninsured and those with Medicaid have worse outcomes.^{2,8,15} In addition, there is growing attention to *underinsurance* especially among lower income surgical patients with private insurance, who can face hardship due to out-of-pocket costs and surprise billing.⁴¹⁻⁴³ We demonstrate that the highest burden of poor health, lower SES, and unmet social health needs are concentrated among those with Medicaid or no insurance. However, in fully adjusted models, lack of insurance was not a predictor for poor health when adjusted for SES and unmet social health needs. This suggests that insurance expansion alone may not fully mitigate inequities - addressing patients' unmet social health needs is needed for optimal postoperative health outcomes. Further, our findings highlight areas in which insurance providers could invest for improved outcomes of their beneficiaries by demonstrating the impact of unmet social health needs on poor health. For example, the Michigan Social Health Interventions to Eliminate Disparities (MSHIELD) is a collaborative quality initiative that was developed in partnership with Blue Cross Blue Shield to screen patients for unmet social health needs (e.g. food insecurity, housing instability, lack of transportation) and link them to community partners who can meet those needs.⁴⁴ This type of multidisciplinary model could be replicated in other settings.

Efforts to reduce inequitable outcomes among surgical patients will require both population-level policies to address the SDOH that are further upstream from health outcomes as well as community- and facility-level programs to address patients' specific unmet social health needs in their own communities. Regarding policy solutions to persistent inequities, we cannot fully address inequitable care without changing structural factors that reinforce these inequities in unmet social health needs. Systemic racism and discriminatory policies have resulted in barriers in access to high quality housing, education, transportation, and medical care.⁴⁵⁻⁵⁰ Our findings reinforce that the distribution of income, education, and employment are racialized. Population differences in SES should be targeted by community-level policies to address historic and ongoing structural bias, discrimination and violence in historically marginalized communities. As such, federal and state policies that mitigate inequities in income, education, and housing should be viewed in light of their potential impact of population health.

In contrast of addressing upstream social determinant of health through state and federal policy, unmet social health needs are often addressed through individual programs at the community or institutional level. There is extensive evidence that programs which target individual unmet social health needs such as food insecurity, housing instability, or inadequate transportation can improve health outcomes.²⁴⁻²⁶ Because many of these programs reduce high-cost, low-value care such as hospital readmissions and preventable

visits to the emergency department, there is a growing evidence base that shows both health benefits and cost savings with such programs. Tailoring these hospital-based and community-based programs to specific surgical populations will be critically important to mitigate longstanding inequities in post-operative outcomes.

These findings must be interpreted in light of the study's limitations. First, the NHIS is a population-based survey, and therefore reports of undergoing surgery in the past year and all other outcomes are self-reported by design. We were unable to account for what procedures respondents had or patients that should have had surgery but were unable to access it, which could introduce sample bias. In addition, the NHIS does not contain detailed clinical information, therefore we were unable to adjust for comorbidities, which can be associated with unmet social health needs and poor health status. However, this database is well suited for this study given it contains rich demographic and socioeconomic data often unavailable in other datasets, as well as providing the patient perspective on both unmet social health needs and health status. Second, while we included measures of SES and social health needs, this list is not exhaustive and there may be other measures of social needs or SDOH that are not included in this study. However, we focused on the three unmet social health needs that have the most data to support interventions. Third, although the data are structured to be nationally representative for all patients, it may not be representative of specific types of surgical patients. However, aggregate numbers provide insight into the drivers of poor health among surgical patients at the population level.

Conclusion

In this analysis of national survey data, we found that one-in-three surgical patients have unmet social health needs. Unmet social health needs vary significantly by race, ethnicity, and insurance and are each independent predictors of poor health among surgical patients. These findings suggest that longstanding inequities in outcomes among surgical patients may be driven, in part, by unmet social health needs. Policies addressing longstanding inequities in SDOH and patient-level programs to intervene on patients' unmet social health needs are urgently needed to achieve optimal health outcomes for *all* surgical patients.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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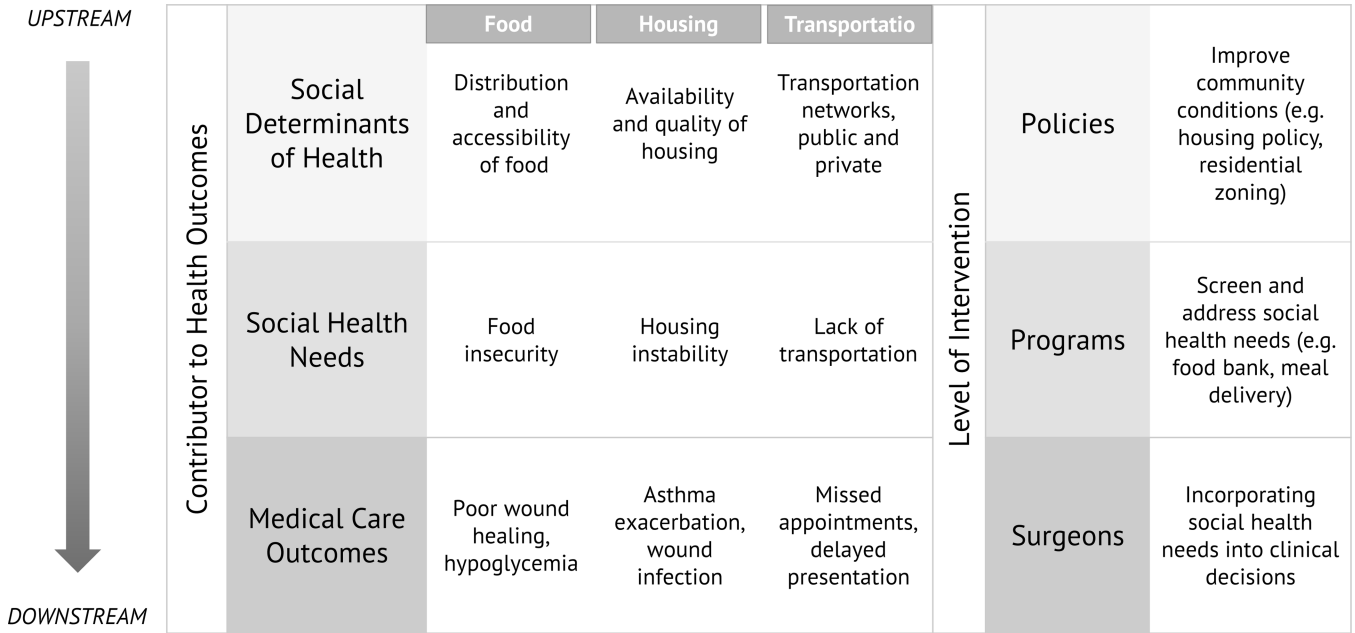
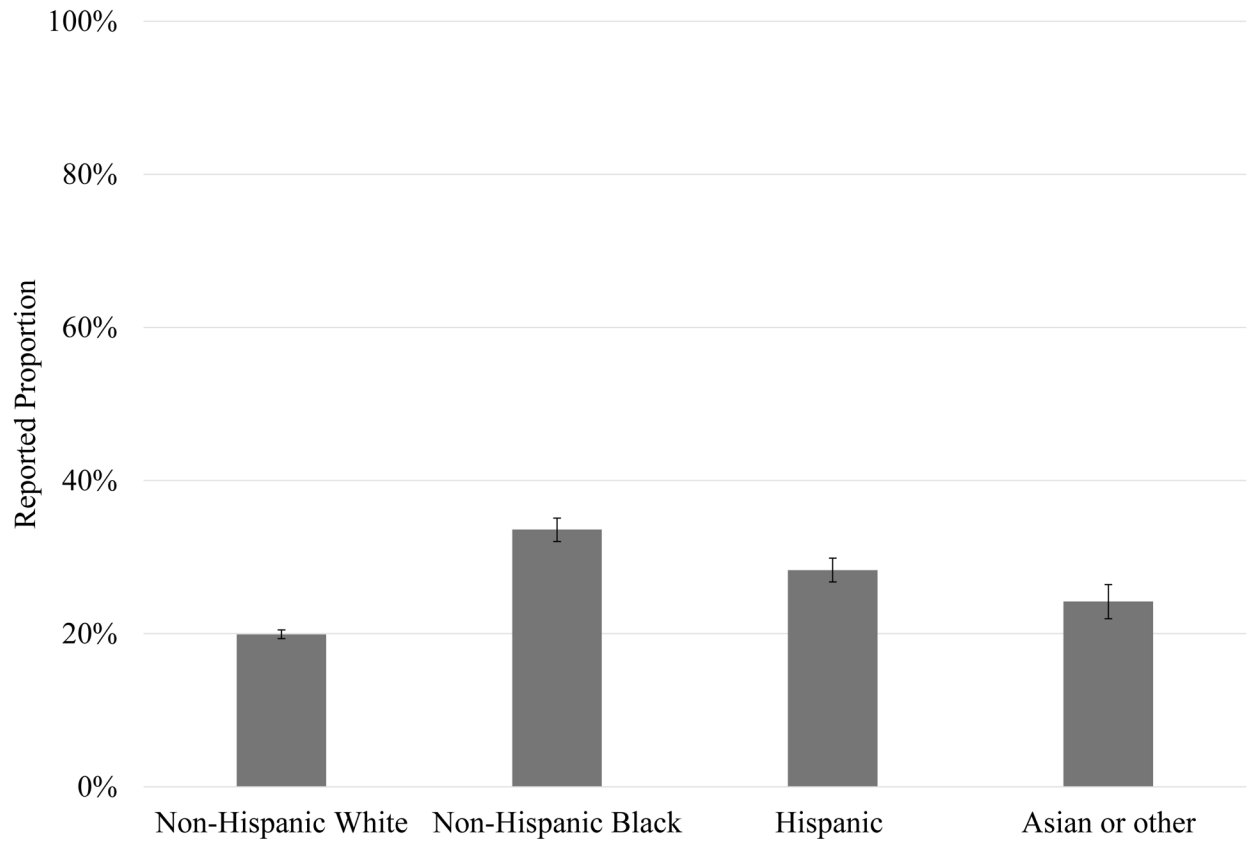


Figure 1:

Social Determinants of Health, Social Health Needs, and Medical Care Outcomes

Note: This figure displays the upstream and downstream social health contributors to physical health outcomes, as well as outlines the levels of interventions that are used to address each of these contributors (social determinants of health, social health needs, and medical care outcomes). Food insecurity, housing instability, and lack of transportation are used as representative domains of social health needs due to the literature supporting their impact on physical health outcomes.

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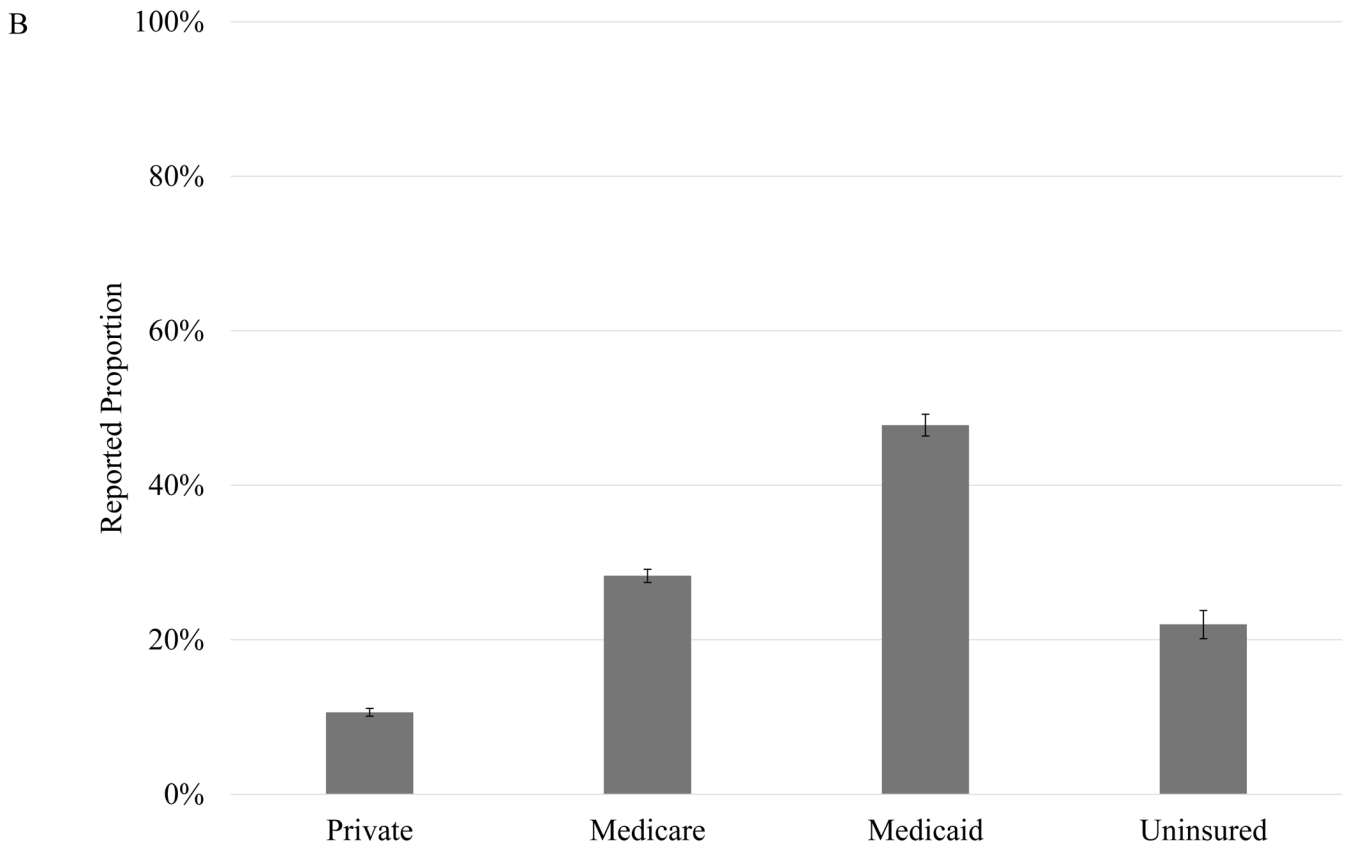


Figure 2:
Poor Health Status Among Surgical Patients by Race, Ethnicity, and Insurance, 2008–2018
A: By Race and Ethnicity
B: By Insurance

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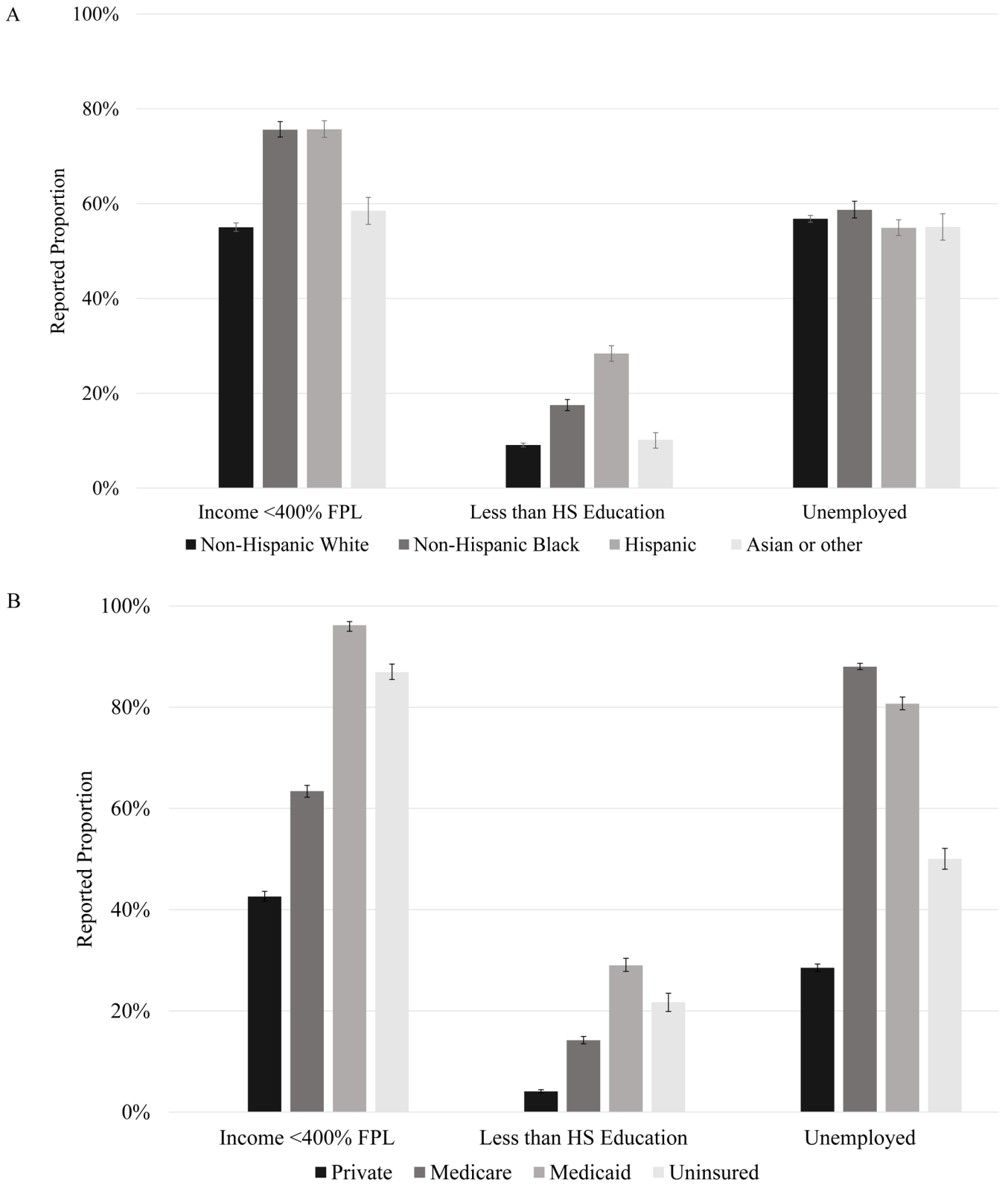


Figure 3:

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Socioeconomic Status Among Surgical Patients by Race, Ethnicity, and Insurance, 2008–2018

A: By Race and Ethnicity

B: By Insurance

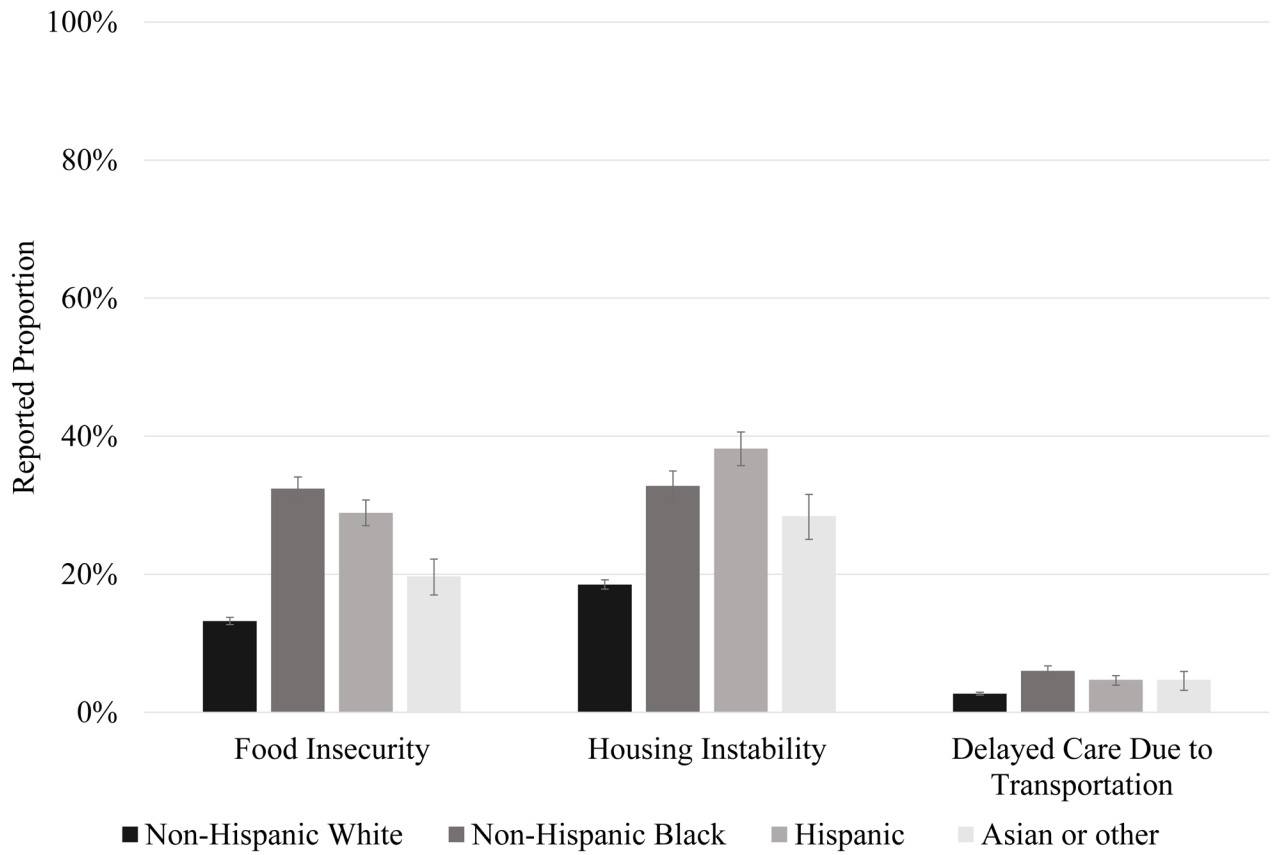
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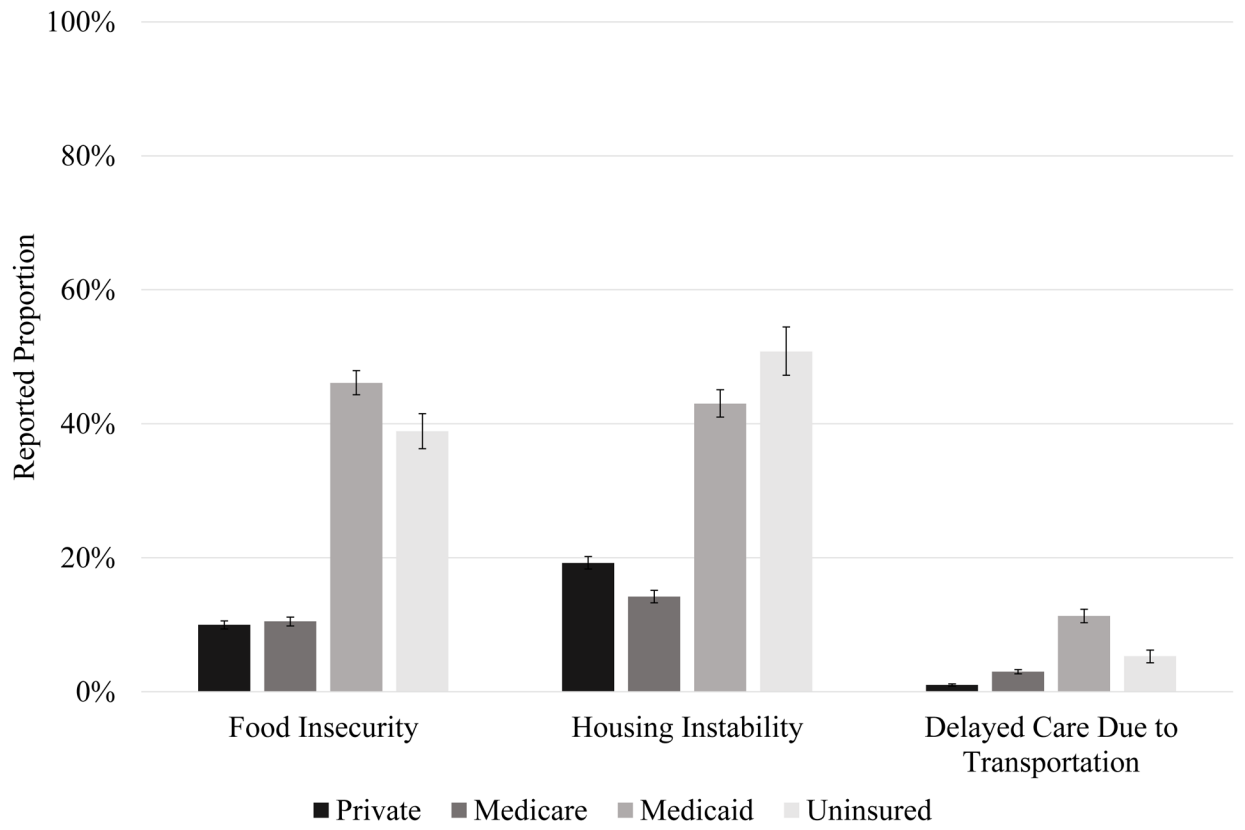


Figure 4:
Unmet Social Health Needs Among Surgical Patients by Race, Ethnicity, and Insurance, 2008–2018
A: By Race and Ethnicity
B: By Insurance

Table 1:

Demographics of Surgical Patients, 2008–2018

Surgical Patients	
Weighted N (N)	14,471,501 (45,495)
Age	
<25	6.6%
25–34	12.3%
35–44	12.5%
45–54	16.0%
55–64	19.8%
65–74	18.1%
>75	14.8%
Gender	
Female	59.9%
Male	40.1%
Race and Ethnicity	
Non-Hispanic White	78.1%
Non-Hispanic Black	9.9%
Hispanic	8.5%
Asian or other	3.5%
Insurance	
Private	45.9%
Medicare	33.3%
Medicaid	12.0%
Uninsured	5.8%
Income	
<400% FPL	58.8%
400% FPL	41.2%
Marital Status	
Not married	47.4%
Married or lives with partner	52.6%
Region	
Northeast	17.1%
Midwest	25.6%
South	36.8%
West	20.5%

Note: FPL = Federal Poverty Level.

Table 2:

Adjusted Odds of Poor Health Among Surgical Patients, 2008–2018

	aOR*	aOR	aOR	aOR
Race and Ethnicity				
Non-Hispanic White	Ref	Ref	Ref	Ref
Non-Hispanic Black	2.28 (2.10–2.47)	1.71 (1.57–1.87)	1.52 (1.38–1.67)	1.41 (1.23–1.62)
Hispanic	2.10 (1.92–2.30)	1.66 (1.51–1.83)	1.29 (1.16–1.44)	1.20 (1.03–1.41)
Asian or Other	1.60 (1.40–1.82)	1.50 (1.29–1.74)	1.36 (1.15–1.61)	1.21 (0.96–1.54)
Insurance				
Private		Ref	Ref	Ref
Medicare		6.14 (5.52–6.82)	2.81 (2.49–3.17)	2.20 (1.84–2.62)
Medicaid		10.53 (9.63–11.53)	3.91 (3.51–4.35)	2.54 (2.17–2.96)
Uninsured		2.79 (2.46–3.17)	1.45 (1.48–2.09)	0.91 (0.71–1.17)
SES				
Income <400% FPL			2.22 (2.05–2.40)	1.74 (1.56–1.95)
Less than high school education			1.71 (1.57–1.86)	1.61 (1.42–1.82)
Unemployed			3.25 (2.99–3.53)	3.14 (2.80–3.53)
Social Health Needs				
Food insecurity				2.14 (1.89–2.41)
Housing instability				1.69 (1.51–1.89)
Delayed care due to lack of transportation				2.58 (2.02–3.31)

Note: aOR = adjusted odds ratio. FPL = Federal Poverty Level.

*aOR adjusted for age, sex, region, survey year. Reference groups for SES: >400% FPL, greater than HS education, employed. Reference groups for social health needs: no food insecurity, no housing instability, no delayed care due to transportation.